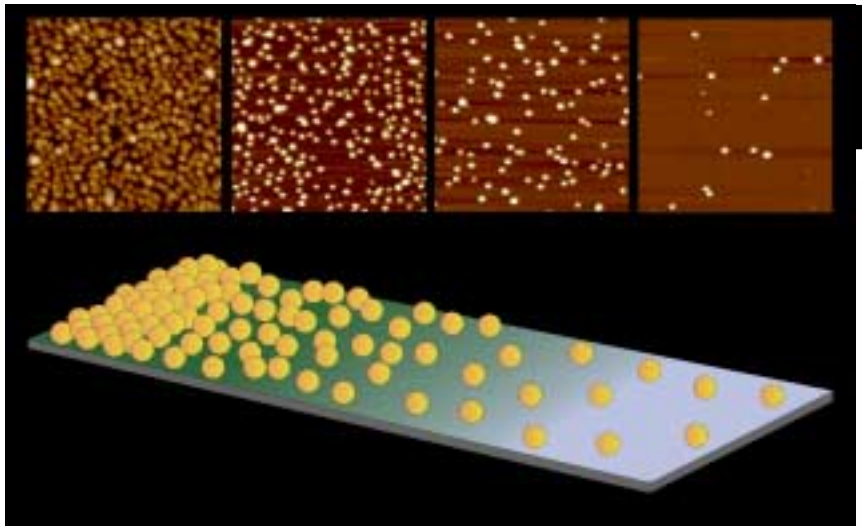
Genzer Research Group

Fabrication of nanoparticle assemblies in ordered polymeric matrices

(Grant No.: DMR-9875256, Program director: Dr. Andrew J. Lovinger)

NC STATE UNIVERSITY

Formation and properties of nanoparticle gradients



An illustration showing Atomic Force Microscopy images and a schematic of a number density gradient of gold nanoparticles attached to silica-covered substrate.

A gradient in particle number density was formed by:

(i) creating a one-dimensional molecular gradient of amino groups on the substrate by vapor deposition of $-NH_2$ terminated APTES organosilane;

(ii) attachment of gold nanoparticles (≈17 nm diameter) to $-NH_2$ functional groups by immersing the substrate in a colloidal gold solution.

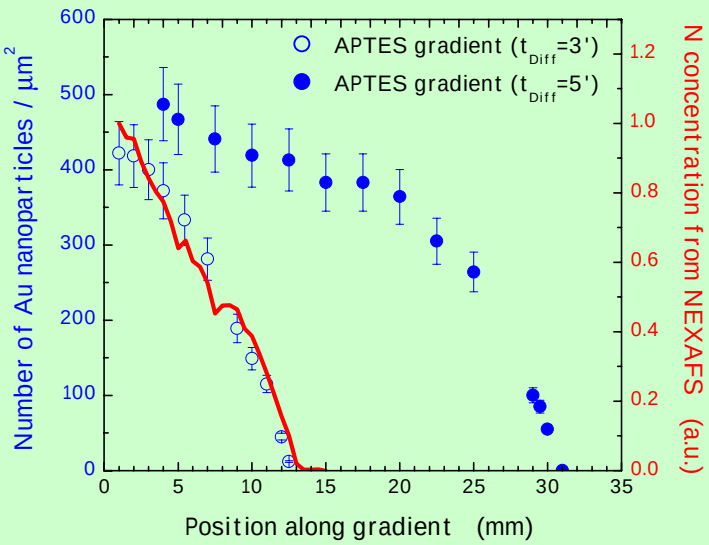
Results:

Number of Au nanoparticles (measured by AFM) follows a gradient profile dictated by the APTES gradient;

Increasing (decreasing) diffusion time of APTES in the vapor results in broader (narrower) nanoparticle gradient;

Au particle gradient follows that of APTES (measured by NEXAFS).

Both single and multiple nanoparticle gradient can be created.

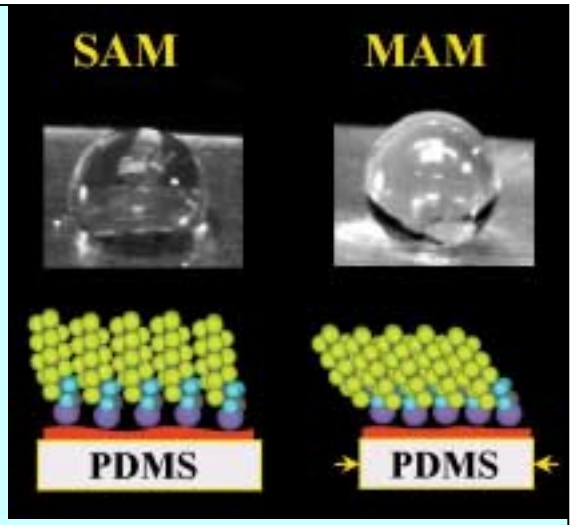


Outreach activities

Public outreach:

More than 45 press releases have been issued about our work on mechanically assembled monolayers ("MAMs") [Science **290**, 2130 (2000)], including New York Times, Financial Times (London), Business Week, and other periodicals.

For detailed list see: http://scf.che.ncsu.edu – section NEWS



United Press International issued an article "Washington is investing in nanotechnology" informing about the to-date progress in the National Nanotechnology Initiative (NNI). In this article, Dr. Michael Rocco, who serves as the chairman of the Interagency Working Group on Nano Science, Engineering and Technology (IWGN), mentioned our work on mechanically assembled monolayers (MAMs) as one of the three examples of nanotechnology-related research supported by the NNI.

The Office of Legislative and Public Affairs at the NSF produced a "tipsheet" to show the press the wide variety of NSF-supported projects. Our work on MAMs was one of 9 projects listed.

Educational outreach:

The PI has lectured to undergraduate chemical engineering students at NC State University (members of the AIChE student chapter) about outstanding research topics in polymer interfacial science.

The PI has continued to develop a new version of his graduate polymer course "Polymers @ surfaces, interfaces and in confined geometries" (the course will be offered in Fall 2002).